

## PATENT ABSTRACTS OF JAPAN

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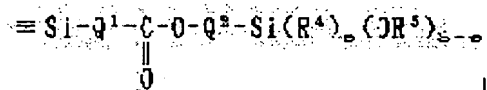
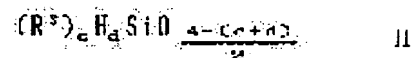
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## (54) SILICONE RUBBER ROLLER FOR HEAT FIXATION

## (57)Abstract:

PURPOSE: To enhance the bonding performance between an inner and an outer layer and provide excellent durability by interposing a specific silicone rubber layer between the inner layer consisting of a thermo-setting silicone rubber molding and the outer layer consisting of a fluoric resin tube.

CONSTITUTION: An inner layer consisting of a thermo-setting silicone rubber molding is provided at the periphery of a roller core shaft while an outer layer consisting of a tube of fluoric resin is provided as enclosing the outside circumference of the inner layer, and between these two layers a silicone rubber layer consisting of (A)-(D) is interposed, where (A) is polyorgano-siloxane containing two constituent units given by Exp. I in one molecule and having a specific viscosity, (B) is polyorgano-hydrodiene-siloxane including constituent unit given by Exp. II and having three hydrogen atoms coupled with silicon atom in one molecule, (C) is compound selected among bromine-silicon compound, etc., including radical given by Exp. III in one molecule, and (D) is platinum compound.



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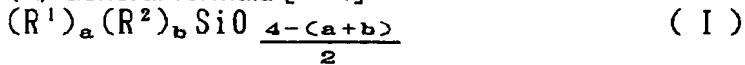
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## CLAIMS

[Claim(s)]

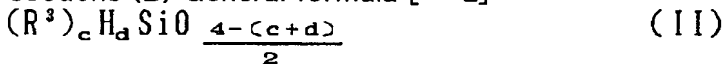
[Claim 1] The silicone rubber roller for heat fixing characterized by making the silicone rubber layer which consists of the following (A) - (D) at least intervene between the above-mentioned inner layer and an outer layer in the silicone rubber roller for heat fixing possessing the inner layer which becomes a roller shaft from the heat hardening mold silicone rubber Plastic solid prepared in the periphery, and the outer layer which consists of a tube made of a fluororesin which covers the periphery of this inner layer.

(A) General formula [\*\* 1]

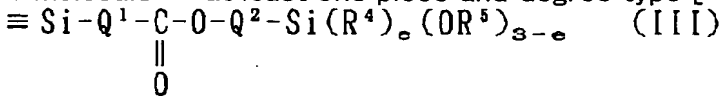


(R1 expresses a vinyl group among a formula, R2 expresses a univalent hydrocarbon group the permutation which does not include an aliphatic series unsaturated bond, or unsubstituted, a expresses 1 or 2, and b expresses 0, 1, or 2.) however, a+b -- 1-3 -- it is -- viscosity [ in / it has the configuration unit shown in / at least two / a molecule, and / 25 degrees C ] -- 500 -500,000cP it is -- polyorganosiloxane The 100 weight

(B) General formula [\*\* 2]

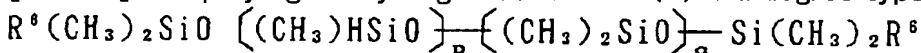


(R3 expresses a permutation or unsubstituted univalent hydrocarbon group among a formula, c expresses 0, 1, or 2, and d expresses 1 or 2.) however, c+d -- 1-3 -- it is -- the number of the hydrogen atom combined with the silicon atom to R11 piece of the polyorgano hydrogen siloxane which has the hydrogen atom which consisted of a configuration unit shown and was combined with the silicon atom in [ at least three ] a molecule, and a component (A) 0.5-4.0 Becoming amount (C) the hydrogen atom combined with the silicon atom -- the inside of 1 molecule -- at least one piece and degree type [\*\* 3]



(Among a formula) Q1 and Q2 a divalent hydrocarbon group expressing --;R4 and R5 -- the univalent hydrocarbon group of carbon numbers 1-4 -- expressing --;e -- 0 or 1 -- expressing -- the compound chosen from the organic silicon compound and acrylic, or methacrylic functionality silane coupling agent which has the radical shown in [ at least one ] 1 molecule -- 0.1 - 10 weight section (D) Amount set to 1-100 ppm as a platinum atom to a platinum system compound (A) component [claim 2] The silicone rubber roller for heat fixing according to claim 1 which the tube made of a fluororesin becomes from a tetrafluoroethylene-perfluoro vinyl ether copolymer.

[Claim 3] The polyorgano hydrogen siloxane of (B) is a degree type [\*\* 4].



It is the silicone rubber roller for heat fixing according to claim 1 which is the compound expressed with [R6 shows a hydrogen atom or a methyl group among a formula, and 1-100 (p when [ however, ] both two R6 is a methyl group 3-100)q show the integer of 0-100 in p].

[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]  
[Field of the Invention] This invention relates to the silicone rubber roller used for the heat fixing section.

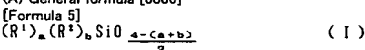
[0002]  
[Description of the Prior Art] As an approach of fixing the toner powder image imprinted on base materials, such as paper, from an imprint drum in a dry-type-electrophotography method on a base material, it lets a base material pass between a heating roller and a pressurization roller, and the approach to which a toner powder image is fixed by heating and pressurizing on a base material is adopted. In this approach, since non-established toner powder tends to adhere to a pressurization roller, the good pressurization roller of a mold-release characteristic with toner powder is demanded, and silicone rubber is conventionally used as a rubber layer of such a pressurization roller. Although this roller made of silicone rubber was comparatively excellent in non-adhesiveness (mold-release characteristic), it had the fault that a roll surface exerted dirt also on image quality, and it exerted a bad influence with a toner etc., with the increment in the count of paper feed. Although the approach of covering a fluororesin on the surface of silicone rubber was taken in order to cancel such a fault, in this kind of roll, there was a fatal fault that silicone rubber and a fluororesin exfoliated, with the increment in a count of paper feed.

[0003]  
[Objects of the Invention] This invention solves the above-mentioned problem, raises the adhesive property between the above-mentioned inner layer and an outer layer in the silicone rubber roller for heat fixing possessing the inner layer which consists of a heat hardening mold silicone rubber Plastic solid prepared in the roller shaft at the periphery, and the outer layer which consists of a tube made of a fluororesin which covers the periphery of this inner layer, and aims at offering the silicone rubber roller for heat fixing excellent in endurance.

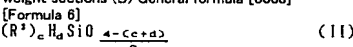
[0004]  
[Elements of the Invention] this invention person etc. came to complete a header and this invention for it being effective to make a specific silicone rubber layer intervene between a inner layer and an outer layer, as a result of inquiring wholeheartedly that the above-mentioned purpose should be attained.

[0005] That is, this invention is a silicone rubber roller for heat fixing characterized by making the silicone rubber layer which consists of the following (A) - (D) at least intervene between the above-mentioned inner layer and an outer layer in the silicone rubber roller for heat fixing possessing the inner layer which becomes a roller shaft from the heat hardening mold silicone rubber Plastic solid prepared in the periphery, and the outer layer which consists of a tube made of a fluororesin which covers the periphery of this inner layer.

(A) General formula [0008]



[0007] (R1 expresses a vinyl group among a formula, R2 expresses a univalent hydrocarbon group the permutation which does not include an aliphatic series unsaturated bond, or unsubstituted, a expresses 1 or 2, and b expresses 0, 1, or 2) however, a+b = 1-3 — it is — viscosity [in / it has the configuration unit shown in / at least two / a molecule, and / 25 degrees C] — 500-500,000cP it is — polyorganosiloxane The 100 weight sections (B) General formula [0008]



[0009] (R3 expresses a permutation or unsubstituted univalent hydrocarbon group among a formula, c expresses

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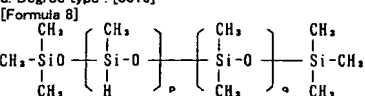
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## JP,06-095545A [DETAILED DESCRIPTION]

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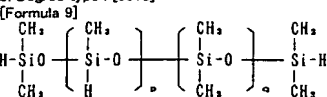
atom in [ at least three ] a molecule. Although what was illustrated in R2 in a formula and the general formula (I) described above as R3, for example, and the same thing can be mentioned, the point of a composite ease to a methyl group is the most desirable. Moreover, as for this polyorgano hydrogen siloxane, it is desirable that the viscosity in 25 degrees C is 1-10,000cP from a composite ease and the ease of handling. As such a polyorgano hydrogen siloxane, although the shape of a straight chain, the letter of branching, annular polymers, or such mixture can be used, the compound shown [ fluororesin ] by the following a and b at the point of making it paste up firmly in a heat hardening mold silicone rubber Plastic solid is desirable.

a. Degree type : [0018]



[0017] The content of the hydrogen atom which it was expressed with (however, p shows the integer of 0-100, as for 3-100q), and was combined with the silicon atom is molecular weight. Straight chain-like polyorgano hydrogen siloxane which is the range which is 0.5 - 1.6 % of the weight.

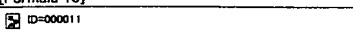
b. Degree type : [0018]



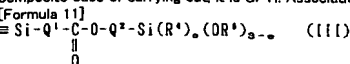
[0019] The content of the hydrogen atom which it was expressed with (however, p shows the integer of 0-100, as for 1-100q), and was combined with the silicon atom is molecular weight. Straight chain-like polyorgano hydrogen siloxane which is the range which is 0.5 - 1.6 % of the weight. The number of the hydrogen atoms combined with the silicon atom in a component (B) the loadings of the component (B) in the constituent of this invention to one vinyl group in a component (A) it is 1.0-3.0 preferably 0.5-4.0 pieces. It is the amount which serves as an individual. The number of hydrogen atoms is 0.5. Without hardening of a constituent fully advancing, when it is under an individual, the degree of hardness after hardening falls, and the number of hydrogen atoms is 4.0. In exceeding an individual, the physical property of the hardened material after hardening deteriorates.

[0020] The organic silicon compound of (C) used for this invention is an indispensable component of this invention which gives the adhesive ability excellent in the silicone rubber constituent of this invention. This is a degree type [0021] further while having the hydrogen atom combined with the silicon atom in [ at least one ] a molecule.

[Formula 10]



[0022] Although it has the radical expressed (as the above-mentioned [ Q1, Q2, R4, R5, and e ] among a formula) in [ at least one ] 1 molecule and is usually a silane derivative or a polysiloxane derivative, from the composite ease of carrying out, it is Si-H. Association and [0023]



[0024] \*\* — it is desirable that it is a thing with the polysiloxane frame contained in a separate siloxane unit. Q1 is the hydrocarbon group which consists of two carbon atomic numbers from a composite ease and hydrolysis-proof nature, or a chain beyond it, especially a general formula [0025].

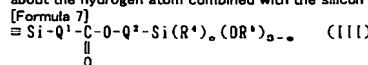
[Formula 12]



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0, 1, or 2, and d expresses 1 or 2.) however, c+d = 1-3 — it is — the polyorgano hydrogen siloxane which has the hydrogen atom which consisted of a configuration unit shown and was combined with the silicon atom in [ at least three ] a molecule — The number of the hydrogen atom combined with the silicon atom to R11 piece of a component (A) 0.5-4.0 Becoming amount (C) It is [ at least one piece and ] a degree type [0010] in 1 molecule about the hydrogen atom combined with the silicon atom.



[0011] (Among a formula) Q1 and Q2 a divalent hydrocarbon group expressing —R4 and R5 — the univalent hydrocarbon group of carbon numbers 1-4 — expressing —a — 0 or 1 — expressing — the compound chosen from the organic silicon compound and acrylic, or methacrylic functionality silane coupling agent which has the radical shown in [ at least one ] 1 molecule — 0.1 - 10 weight section (D) The configuration of the silicone rubber roller for heat fixing of this invention is explained below the amount set to 1-100 ppm as a platinum atom to a platinum system compound (A) component. As long as a mechanical strength is enough, the thing of which the quality of the material is sufficient as iron, aluminum, stainless steel, etc., and priming of the metal rodding on the roll used for this invention may be carried out. Especially the heat hardening mold silicone rubber of an inner layer used for this invention is not limited, and the addition reaction mold liquefied silicone rubber conventionally used for this kind of rubber roller, millable type silicone rubber, millable-type-silicone-rubber sponge, etc. can be used for it.

[0012] As an example of the fluororesin used by this invention, tetrafluoroethylene resin, a tetrafluoroethylene-perfluoro vinyl ether copolymer, a tetrafluoroethylene-6 fluoride propylene copolymer, a tetrafluoroethylene-ethylene copolymer, polyvinylidene fluoride, etc. are mentioned, and it can obtain in the form of heat-shrinkable tubing, a film, etc. In the tube made of a fluororesin, what was processed by the sodium naphthalene method, the sputter etching method, the corona discharge approach, etc. in the inside strengthens adhesion with silicone rubber more, and it is useful, and what consists of a tetrafluoroethylene-perfluoro vinyl ether copolymer especially is excellent in an adhesive property and thermal resistance, and it is useful.

[0013] The roller of this invention is manufactured according to the following processes. First, the enveloping layer of heat hardening mold silicone rubber is formed in the periphery of metal rodding. In this case, metal rodding by which priming was generally beforehand carried out into cylindrical metal mold is set, and addition reaction liquefied silicone rubber or millable type silicone rubber is poured in thru/ or transfer-molded. In this way, after applying the silicone rubber constituent which consists of aforementioned component (A) - (D) to the obtained silicone rubber roller front face, the tube made of a fluororesin is covered, and the target roller is obtained by heat-treating. The silicone rubber constituent used here is limited to the thing of an above-mentioned presentation, in order to make a heat hardening mold silicone rubber Plastic solid (inner layer) and a fluororesin (outer layer) paste up firmly, to excel in endurance as a heat fixing roller and to acquire a prolonged life.

[0014] The polyorganosiloxane of the component (A) used for this invention has the configuration unit shown by the formula (I) containing the vinyl group R1 combined with the silicon atom in [ at least two ] 1 molecule. As this polyorganosiloxane, both the shape of a straight chain and the letter of branching can be used, and such mixture can also be used, as the univalent hydrocarbon group R2 the permutation which does not include an aliphatic series unsaturated bond, or unsubstituted — aralkyl radical, for example like aryl group:beta-phenylethyl like alkyl group; phenyl, such as methyl, ethyl, propyl, butyl, hexyl, and dodecyl, and beta-phenylpropyl — permutation hydrocarbon groups, such as KURORU methyl, 3 and 3, and 3-trifluoro propyl, can be mentioned further. As a hydrocarbon group R2 from the point of composition of polyorganosiloxane being easy, and giving polymerization degree required when maintaining a good physical property after hardening moreover, and giving low viscosity before hardening among these radicals, a methyl group is the most desirable. Although the configuration unit shown by such formula (I) may exist in any in the chain end of polyorganosiloxane, or a chain, in order to give the mechanical property excellent in the hardened material, it is desirable to exist in one [ at least ] chain end, moreover, viscosity [ in / in the polyorganosiloxane of a component (A) / 25 degrees C ] 500-500,000cP it is — especially — 1,000-200,000cP it is — things are desirable. Viscosity is 500cP(s). It is difficult to give the sufficient elongation and the elasticity for a hardened material, when it is the following, and it is 500,000cP(s). When exceeding, the fall of the workability at the time of fabrication is caused.

[0015] The polyorgano hydrogen siloxane of the component (B) used by this invention consists of a configuration unit shown by the above-mentioned general formula (II), and it has the hydrogen atom combined with the silicon

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[0026] What is expressed with (R7 shows among a formula the univalent radical chosen from a hydrogen atom or a methyl group) is desirable. Moreover, Q2 has the hydrocarbon group which consists of three carbon atomic numbers from hydrolysis-proof nature, or a chain beyond it, especially a desirable propylene radical. Although th alkyl group of the carbon numbers 1-4, such as a methyl group, an ethyl group, a propyl group, an isopropyl group, and butyl, is illustrated as R4 and R5, a methyl group and an ethyl group are desirable at the point of giving a good adhesive property. The siloxane unit containing such a side chain is Si-H in a molecule a part. It is compoundable by the approach of making thoria RUKOKISHI thru/ or dialkoxo silyl propyl ester of an acrylic acid or a methacrylic acid add to association etc. Although such a siloxane frame of an organic silicon compound may be annular, a chain-like may be used or both mixture is sufficient, what has an annular polysiloxane frame from a composite ease is the most desirable. When annular, as for the 3-6 number of the silicon atoms which form a siloxane ring, four things are preferably used from a composite ease. Since viscosity will become high and will become inconvenient to composition or handling if molecular weight is large in the case of like [ chain ], as for 2-20 silicon atoms which form a siloxane chain, 4-10 things are used preferably. (C) The acrylic or methacrylic functionality silane coupling agent which is another side of a component is a component for giving an adhesive property to this invention constituent as well as the above-mentioned organic silicon compound. As this component, gamma-methacryloxypropyl trimethoxy silane, gamma-methacryloxypropyl triethoxysilane, gamma-acryloxypropyltrimethoxysilane, gamma-acryloxypropyltriethoxysilane, meta-chenstrut ROKISHI methyl trimethoxysilane, and acryloxy methyl trimethoxysilane are illustrated. (C) the loadings of a component are the (A) component. As opposed to the 100 weight sections It is 0.1 - 10 weight section. (C) The loadings of a component it becomes what the rubber-like elasticity object lacked in the self-adhesive property that they were under the 0.1 weight sections as for, and if 10 weight sections are exceeded, the elasticity of a rubber-like elasticity object will fall.

[0027] The platinum system compound of a component (D) used by this invention is a catalyst component which promotes the addition reaction between the vinyl group in a component (A), and the hydrosilyl radical in a component (B). As such a platinum system compound, platinum coordination compounds, such as a platinum simple substance, and chloroplatinic acid, a platinum-olefin complex or a platinum-alcoholic complex, etc. can be mentioned, for example, the loadings of a component (D) — a component (A) — receiving — as a platinum atom — 1-100 ppm — it is — desirable — 2-50 ppm it is. Loadings are 1 ppm. When it is the following, even if it cannot attain sufficient hardening of rubber and blends exceeding 100 ppm, the effective improvement in the cure rate beyond it is not obtained any longer.

[0028]

[Effect of the Invention] Since the roller of this invention is excellent in the adhesion endurance of the silicone rubber of an inner layer, and the fluororesin of an outer layer, it is useful as a roller for heat fixing.

[0029]

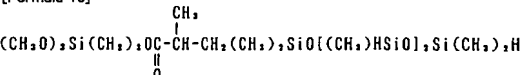
[Example] Hereafter, although an example explains this invention in more detail, thereby, this invention is not limited. In addition, the "section" in an example expresses the "weight section", and viscosity expresses the value in 25 degrees C.

Poly dimethylsiloxane base oil by which the chain both ends of 10,000cP(s) were blocked for the <example 1 of preparation> viscosity by the dimethyl vinyl silyl radical The 100 sections. The hydrogen content combined with the silicon atom with which both ends were blocked by the trimethylsilyl radical at 0.90 % of the weight The straight chain-like poly methyl hydrogen siloxane 3 section of viscosity 25cP. It is 20 ppm to a base oil, using the mist silica 20 section, the gamma-methacryloxypropyl-trimethoxy-silane 3 section, and the isopropyl alcohol solution of chloroplatinic acid as a platinum atom. It mixed so that it might become, and homogeneity was distributed, and the silicone rubber constituent 1 was prepared.

[0030] Poly dimethylsiloxane base oil by which the chain both ends of 50,000cP(s) were blocked for the <example 2 of preparation> viscosity by the dimethyl vinyl silyl radical The 100 sections. Viscosity at 1.02 % of the weight The straight chain-like poly methyl hydrogen siloxane 2 section of 30cP(s). [ the hydrogen content combined with the silicon atom with which both ends were blocked by the trimethylsilyl radical ] It is 30 ppm to base oil, using the five sections and the isopropyl alcohol solution of chloroplatinic acid as a platinum atom for the mist silica 10 section and the following organic silicon compound A. It mixed so that it might become, and homogeneity was distributed, and the silicone rubber constituent 2 was prepared.

[0031] Organic silicon compound A [0032]

[Formula 13]



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[0033] In the example 1 of the <example 3 of preparation> preparation, the silicone rubber constituent 3 was similarly prepared except using the gamma-glycidioxypropyltrimethoxysilane 3 section instead of gamma-methacryloxypropyl trimethoxy silane.

[0034] Example 1 diameter [ of 8mm ] x die length of 300mm It is roll outer-diameter [ of 28mm ] x die length of 250mm on an aluminum shaft about heat hardening mold silicone rubber TSE270-4U (a trade name, Toshiba Silicone make). The shape of a cylinder is made to carry out shaping hardening, further — the front face — the silicone rubber constituent 1 of the example 1 of preparation — 0.1mm in thickness the heat-shrinkable tubing of a tetrafluoroethylene [ after applying to homogeneity so that it may become ]-6 fluoride propylene copolymer — 40 micrometers it covers with thickness — heat hardening was carried out for 30 minutes at 120 degree C, and the roll was produced. In order to perform the mounting trial of this roll, this thing is incorporated as a fixing roll of a PPC copying machine, and it is pressure 3 kgf/cm<sup>2</sup> between rolls. When the copy of 100,000 sheets was performed, no abnormalities were seen by the roll itself but the good duplication was obtained.

[0035] Example 2 diameter [ of 8mm ] x die length of 300mm It is roll outer-diameter [ of 28mm ] x die length of 250mm on an aluminum shaft about heat hardening mold silicone rubber TSE3402 (a trade name, Toshiba Silicone make). The shape of a cylinder is made to carry out shaping hardening, further — the front face — the silicone rubber constituent 2 of the example 2 of preparation — 0.2mm in thickness the heat-shrinkable tubing of a tetrafluoroethylene [ after applying to homogeneity so that it may become ]-6 fluoride propylene copolymer — 40 micrometers it covers with thickness — heat hardening was carried out for 30 minutes at 120 degree C, and the roll was produced. In order to perform the mounting trial of this roll, this thing is incorporated as a fixing roll of a PPC copying machine, and it is pressure 3 kgf/cm<sup>2</sup> between rolls. When the copy of 50,000 sheets was performed, no abnormalities were seen by the roll itself but the good duplication was obtained.

[0036] In example of comparison 1 example 1, except using the condensation reaction mold 1 component system silicone sealant TSE370 (a trade name, Toshiba Silicone make) instead of the silicone rubber constituent 1, when rolled similarly, the paper jam generated production and a mounting trial with the extraordinary noise by 8 omasum eye. The roll itself and the surface fluorine tube had mostly exfoliated.

[0037] In example of comparison 2 example 2, except using the silicone rubber constituent 3 of the example 3 of preparation instead of the silicone rubber constituent 2, when rolled similarly, paper JIWA generated production and a mounting trial with the extraordinary noise by the 20,008 omasum eye. A part of roll itself and surface fluorine tube had exfoliated.

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## TECHNICAL FIELD

[Field of the Invention] This invention relates to the silicone rubber roller used for the heat fixing section.

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JP.06-095545.A [EFFECT OF THE INVENTION]

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## EFFECT OF THE INVENTION

[Effect of the Invention] Since the roller of this invention is excellent in the adhesion endurance of the silicone rubber of an inner layer, and the fluororesin of an outer layer, it is useful as a roller for heat fixing.

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JP.06-095545.A [TECHNICAL PROBLEM]

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## TECHNICAL PROBLEM

[Description of the Prior Art] As an approach of fixing the toner powder image imprinted on base materials, such as paper, from an imprint drum in a dry-type-electrophotography method on a base material, it lets a base material pass between a heating roller and a pressurization roller, and the approach to which a toner powder image is fixed by heating and pressurizing on a base material is adopted. In this approach, since non-established toner powder tends to adhere to a pressurization roller, the good pressurization roller of a mold-release characteristic with toner powder is demanded, and silicone rubber is conventionally used as a rubber layer of such a pressurization roller. Although this roller made of silicone rubber was comparatively excellent in non-adhesiveness (mold-release characteristic), it had the fault that a roll surface exerted dirt also on image quality and it exerted a bad influence with a toner etc., with the increment in the count of paper feed. Although the approach of covering a fluororesin on the surface of silicone rubber was taken in order to cancel such a fault, in this kind of roll, there was a fatal fault that silicone rubber and a fluororesin exfoliated, with the increment in a count of paper feed.

[0003]

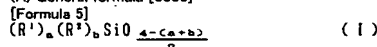
[Objects of the Invention] This invention solves the above-mentioned problem, raises the adhesive property between the above-mentioned inner layer and an outer layer in the silicone rubber roller for heat fixing possessing the inner layer which consists of a heat hardening mold silicone rubber Plastic solid prepared in the roller shaft at the periphery, and the outer layer which consists of a tube made of a fluororesin which covers the periphery of this inner layer, and aims at offering the silicone rubber roller for heat fixing excellent in endurance.

[0004]

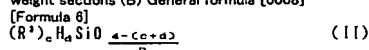
[Elements of the Invention] this invention person etc. came to complete a header and this invention for it being effective to make a specific silicone rubber layer intervene between an inner layer and an outer layer, as a result of inquiring wholeheartedly that the above-mentioned purpose should be attained.

[0005] That is, this invention is a silicone rubber roller for heat fixing characterized by making the silicone rubber layer which consists of the following (A) - (D) at least intervene between the above-mentioned inner layer and an outer layer in the silicone rubber roller for heat fixing possessing the inner layer which becomes a roller shaft from the heat hardening mold silicone rubber Plastic solid prepared in the periphery, and the outer layer which consists of a tube made of a fluororesin which covers the periphery of this inner layer.

(A) General formula [0006]

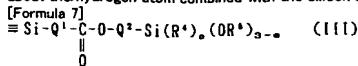


[0007] (R<sup>1</sup>) expresses a vinyl group among a formula, R<sup>2</sup> expresses a univalent hydrocarbon group the permutation which does not include an aliphatic series unsaturated bond, or unsubstituted, a expresses 1 or 2, and b expresses 0, 1, or 2, however, a+b — 1-3 — it is — viscosity [ in / it has the configuration unit shown in / at least two / a molecule, and / 25 degrees C ] — 500 -500,000cP it is — polyorganosiloxane The 100 weight sections (B) General formula [0008]



[0009] (R<sup>3</sup>) expresses a permutation or unsubstituted univalent hydrocarbon group among a formula, c expresses 0, 1, or 2, and d expresses 1 or 2, however, c+d — 1-3 — it is — the polyorgano hydrogen siloxane which has the hydrogen atom which consisted of a configuration unit shown and was combined with the silicon atom in [ a least three ] a molecule — The number of the hydrogen atom combined with the silicon atom to R11 piece of a component (A) 0.5-4.0 Becoming amount (C) It is [ at least one piece and ] a degree type [0010] in 1 molecule

about the hydrogen atom combined with the silicon atom.



[0011] (Among a formula Q1 and Q2 a divalent hydrocarbon group expressing —R4 and R5 — the univalent hydrocarbon group of carbon numbers 1-4 — expressing —a — 0 or 1 — expressing — the compound chosen from the organic silicon compound and acrylic, or methacrylic functionality silane coupling agent which has the radical shown in [ at least one ] 1 molecule — 0.1 ~ 10 weight section (D) The configuration of the silicone rubber roller for heat fixing of this invention is explained below the amount set to 1-100 ppm as a platinum atom to a platinum system compound (A) component. As long as a mechanical strength is enough, the thing of which the quality of the material is sufficient as iron, aluminum, stainless steel, etc., and priming of the metal rodding of the roll used for this invention may be carried out. Especially the heat hardening mold silicone rubber of a inner layer used for this invention is not limited, and the addition reaction mold liquefied silicone rubber conventionally used for this kind of rubber roller, millable type silicone rubber, millable-type-silicone-rubber sponge, etc. can be used for it.

[0012] As an example of the fluororesin used by this invention, tetrafluoroethylene resin, a tetrafluoroethylene-perfluoro vinyl ether copolymer, a tetrafluoroethylene-8 fluoride propylene copolymer, a tetrafluoroethylene-ethylene copolymer, polyvinylidene fluoride, etc. are mentioned, and it can obtain in the form of heat-shrinkable tubing, a film, etc. In the tube made of a fluororesin, what was processed by the sodium naphthalene method, the sputter etching method, the corona discharge approach, etc. in the inside strengthens adhesion with silicone rubber more, and it is useful, and what consists of a tetrafluoroethylene-perfluoro vinyl ether copolymer especially is excellent in an adhesive property and thermal resistance, and it is useful.

[0013] The roller of this invention is manufactured according to the following processes. First, the enveloping layer of heat hardening mold silicone rubber is formed in the periphery of metal rodding. In this case, metal rodding by which priming was generally beforehand carried out into cylindrical metal mold is set, and addition reaction liquefied silicone rubber or millable type silicone rubber is poured in thru/ or transfer-molded. In this way, after applying the silicone rubber constituent which consists of aforementioned component (A) — (D) to the obtained silicone rubber roller front face, the tube made of a fluororesin is covered, and the target roller is obtained by heat-treating. The silicone rubber constituent used here is limited to the thing of an above-mentioned presentation, in order to make a heat hardening mold silicone rubber Plastic solid (inner layer) and a fluororesin (outer layer) paste up firmly, to excel in endurance as a heat fixing roller and to acquire a prolonged life.

[0014] The polyorganosiloxane of the component (A) used for this invention has the configuration unit shown by the formula (I) containing the vinyl group R1 combined with the silicon atom in [ at least two ] 1 molecule. As this polyorganosiloxane, both the shape of a straight chain and the letter of branching can be used, and such mixture can also be used, as the univalent hydrocarbon group R2 the permutation which does not include an aliphatic series unsaturated bond, or unsubstituted — aralkyl radical, for example like aryl group, beta-phenylethyl like alkyl group; phenyl, such as methyl, ethyl, propyl, butyl, hexyl, and dodecyl, and beta-phenylpropyl — permutation hydrocarbon groups, such as KURORU methyl, 3 and 3, and 3-trifluoro propyl, can be mentioned further. As a hydrocarbon group R2 from the point of composition of polyorganosiloxane being easy, and giving polymerization degree required when maintaining a good physical property after hardening moreover, and giving low viscosity before hardening among these radicals, a methyl group is the most desirable. Although the configuration unit shown by such formula (I) may exist in any in the chain end of polyorganosiloxane, or a chain, in order to give the mechanical property excellent in the hardened material, it is desirable to exist in one [ at least ] chain end. moreover, viscosity [ in / in the polyorganosiloxane of a component (A) / 25 degrees C ] 500-500,000cP it is — especially — 1,000 ~ 200,000cP it is — things are desirable. Viscosity is 500cP(s). It is difficult to give the sufficient elongation and the elasticity for a hardened material, when it is the following, and it is 500,000cP(s). When exceeding, the fall of the workability at the time of fabrication is caused.

[0015] The polyorgano hydrogen siloxane of the component (B) used by this invention consists of a configuration unit shown by the above-mentioned general formula (II), and it has the hydrogen atom combined with the silicon atom in [ at least three ] a molecule. Although what was illustrated in R2 in a formula-and the general formula (I) described above as R3, for example, and the same thing can be mentioned, the point of a composite ease to a methyl group is the most desirable. Moreover, as for this polyorgano hydrogen siloxane, it is desirable that the viscosity in 25 degrees C is 1-10,000cP from a composite ease and the ease of handling. As such a polyorgano

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group, and butyl, is illustrated as R4 and R5, a methyl group and an ethyl group are desirable at the point of giving a good adhesive property. The siloxane unit containing such a side chain is Si-H in a molecule a part. It is compoundable by the approach of making thoria RUKOKISHI thru/ or dialkoxy silyl propyl ester of an acrylic acid or a methacrylic acid add to association etc. Although such a siloxane frame of an organic silicon compound may be annular, a chain-like may be used or both mixture is sufficient, what has an annular polysiloxane frame from a composite ease is the most desirable. When annular, as for the 3-6 number of the silicon atoms which form a siloxane ring, four things are preferably used from a composite ease. Since viscosity will become high and will become inconvenient to composition or handling if molecular weight is large in the case of-like [ chain ], as for 2-20 silicon atoms which form a siloxane chain, 4-10 things are used preferably. (C) The acrylic or methacrylic functionality silane coupling agent which is another side of a component is a component for giving an adhesive property to this invention constituent as well as the above-mentioned organic silicon compound. As this component, gamma-methacryloxypropyl trimethoxy silane, gamma-methacryloxypropyl triethoxysilane, gamma-acryloxypropyltrimethoxysilane, gamma-acryloxypropyltriethoxysilane, meta-chestnut ROKISHI methyl trimethoxysilane, and acryloxy methyl trimethoxysilane are illustrated. (C) The loadings of a component are the (A) component. As opposed to the 100 weight sections it is 0.1 ~ 10 weight section. (C) The loadings of a component it becomes what the rubber-like elasticity object lacked in the self-adhesive property that they were under the 0.1 weight sections as for, and if 10 weight sections are exceeded, the elasticity of a rubber-like elasticity object will fall.

[0027] The platinum system compound of a component (D) used by this invention is a catalyst component which promotes the addition reaction between the vinyl group in a component (A), and the hydrosilyl radical in a component (B). As such a platinum system compound, platinum coordination compounds, such as a platinum simple substance, and chloroplatinic acid, a platinum-olefin complex or a platinum-alcoholic complex, etc. can be mentioned, for example, the loadings of a component (D) — a component (A) — receiving — as a platinum atom — 1-100 ppm — it is — desirable — 2-50 ppm it is. Loadings are 1 ppm. When it is the following, even if it cannot attain sufficient hardening of rubber and blends exceeding 100 ppm, the effective improvement in the cure rate beyond it is not obtained any longer.

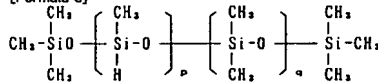
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hydrogen siloxane, although the shape of a straight chain, the letter of branching, annular polymers, or such mixture can be used, the compound shown [ fluororesin ] by the following a and b at the point of making it paste up firmly in a heat hardening mold silicone rubber Plastic solid is desirable.

a. Degree type : [0016]

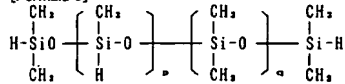
[Formula 8]



[0017] The content of the hydrogen atom which it was expressed with (however, p shows the integer of 0-100, as for 3-100q), and was combined with the silicon atom is molecular weight. Straight chain-like polyorgano hydrogen siloxane which is the range which is 0.5 ~ 1.8 % of the weight.

b. Degree type : [0018]

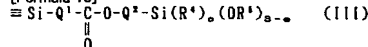
[Formula 9]



[0019] The content of the hydrogen atom which it was expressed with (however, p shows the integer of 0-100, as for 1-100q), and was combined with the silicon atom is molecular weight. Straight chain-like polyorgano hydrogen siloxane which is the range which is 0.5 ~ 1.8 % of the weight. The number of the hydrogen atoms combined with the silicon atom in a component (B) the loadings of the component (B) in the constituent of this invention to one vinyl group in a component (A) It is 1.0-3.0 preferably 0.5-4.0 pieces. It is the amount which serves as an individual. The number of hydrogen atoms is 0.5. Without hardening of a constituent fully advancing when it is under an individual, the degree of hardness after hardening falls, and the number of hydrogen atoms is 4.0. In exceeding an individual, the physical property of the hardened material after hardening deteriorates.

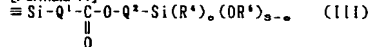
[0020] The organic silicon compound of (C) used for this invention is an indispensable component of this invention which gives the adhesive ability excellent in the silicone rubber constituent of this invention. This is a degree type [0021] further while having the hydrogen atom combined with the silicon atom in [ at least one ] a molecule.

[Formula 10]



[0022] Although it has the radical expressed (as the above-mentioned [ Q1, Q2, R4, R5, and e ] among a formula) in [ at least one ] 1 molecule and is usually a silane derivative or a polysiloxane derivative, from the composite ease of carrying out, it is Si-H. Association and [0023]

[Formula 11]



[0024] \*\* -- it is desirable that it is a thing with the polysiloxane frame contained in a separate siloxane unit. Q is the hydrocarbon group which consists of two carbon atomic numbers from a composite ease and hydrolysis-proof nature, or a chain beyond it, especially a general formula [0025].

[Formula 12]



[0026] What is expressed with (R7 shows among a formula the univalent radical chosen from a hydrogen atom or a methyl group) is desirable. Moreover, Q2 has the hydrocarbon group which consists of three carbon atomic numbers from hydrolysis-proof nature, or a chain beyond it, especially a desirable propylene radical. Although the alkyl group of the carbon numbers 1-4, such as a methyl group, an ethyl group, a propyl group, an isopropyl

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## EXAMPLE

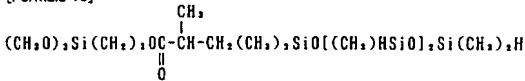
[Example] Hereafter, although an example explains this invention in more detail, thereby, this invention is not limited. In addition, the "section" in an example expresses the "weight section", and viscosity expresses the value in 25 degrees C.

Poly dimethylsiloxane base oil by which the chain both ends of 10,000cP(s) were blocked for the <example 1 of preparation> viscosity by the dimethyl vinyl silyl radical The 100 sections. The hydrogen content combined with the silicon atom with which both ends were blocked by the trimethylsilyl radical at 0.90 % of the weight The straight chain-like poly methyl hydrogen siloxane 3 section of viscosity 25cP. It is 20 ppm to a base oil, using the mist silica 20 section, the gamma-methacryloxypropyl-trimethoxy-silane 3 section, and the isopropyl alcohol solution of chloroplatinic acid as a platinum atom. It mixed so that it might become, and homogeneity was distributed, and the silicone rubber constituent 1 was prepared.

[0030] Poly dimethylsiloxane base oil by which the chain both ends of 50,000cP(s) were blocked for the <example 2 of preparation> viscosity by the dimethyl vinyl silyl radical The 100 sections. Viscosity at 1.02 % of the weight The straight chain-like poly methyl hydrogen siloxane 2 section of 30cP(s). [ the hydrogen content combined with the silicon atom with which both ends were blocked by the trimethylsilyl radical ] It is 30 ppm to base oil, using the five sections and the isopropyl alcohol solution of chloroplatinic acid as a platinum atom for the mist silica 10 section and the following organic silicon compound A. It mixed so that it might become, and homogeneity was distributed, and the silicone rubber constituent 2 was prepared.

[0031] Organic silicon compound A [0032]

[Formula 13]



[0033] In the example 1 of the <example 3 of preparation> preparation, the silicone rubber constituent 3 was similarly prepared except using the gamma-glycidyloxypropyltrimethoxysilane 3 section instead of gamma-methacryloxypropyl trimethoxy silane.

[0034] Example 1 diameter [ of 8mm ] x die length of 300mm It is roll outer-diameter [ of 28mm ] x die length or 250mm on an aluminum shaft about heat hardening mold silicone rubber TSE270-4U (a trade name, Toshiba Silicone make). The shape of a cylinder is made to carry out shaping hardening, further — the front face — the silicone rubber constituent 1 of the example 1 of preparation — 0.1mm in thickness the heat-shrinkable tubing of a tetrafluoroethylene [ after applying to homogeneity so that it may become ]-8 fluoride propylene copolymer — 40 micrometers it covers with thickness — heat hardening was carried out for 30 minutes at 120 degree C, and the roll was produced. In order to perform the mounting trial of this roll, this thing is incorporated as a fixing roll of a PPC copying machine, and it is pressure 3 kgf/cm2 between rolls. When the copy of 100,000 sheets was performed, no abnormalities were seen by the roll itself but the good duplication was obtained.

[0035] Example 2 diameter [ of 8mm ] x die length of 300mm It is roll outer-diameter [ of 28mm ] x die length or 250mm on an aluminum shaft about heat hardening mold silicone rubber TSE3402 (a trade name, Toshiba Silicone make). The shape of a cylinder is made to carry out shaping hardening, further — the front face — the silicone rubber constituent 2 of the example 2 of preparation — 0.2mm in thickness the heat-shrinkable tubing of a tetrafluoroethylene [ after applying to homogeneity so that it may become ]-6 fluoride propylene copolymer — 40 micrometers it covers with thickness — heat hardening was carried out for 30 minutes at 120 degree C, and the roll was produced. In order to perform the mounting trial of this roll, this thing is incorporated as a fixing roll of a PPC copying machine, and it is pressure 3 kgf/cm2 between rolls. When the copy of 50,000 sheets was performed, no abnormalities were seen by the roll itself but the good duplication was obtained.

[0036] In example of comparison 1 example 1, except using the condensation reaction mold 1 component system silicone sealant TSE370 (a trade name, Toshiba Silicone make) instead of the silicone rubber constituent 1, when rolled similarly, the paper jam generated production and a mounting trial with the extraordinary noise by 8 omasum eye. The roll itself and the surface fluorine tube had mostly exfoliated.

[0037] In example of comparison 2 example 2, except using the silicone rubber constituent 3 of the example 3 of preparation instead of the silicone rubber constituent 2, when rolled similarly, paper JIWA generated production and a mounting trial with the extraordinary noise by the 20,008 omasum eye. A part of roll itself and surface fluorine tube had exfoliated.

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